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Fighting Aquatic Invasive Species in West Virginia

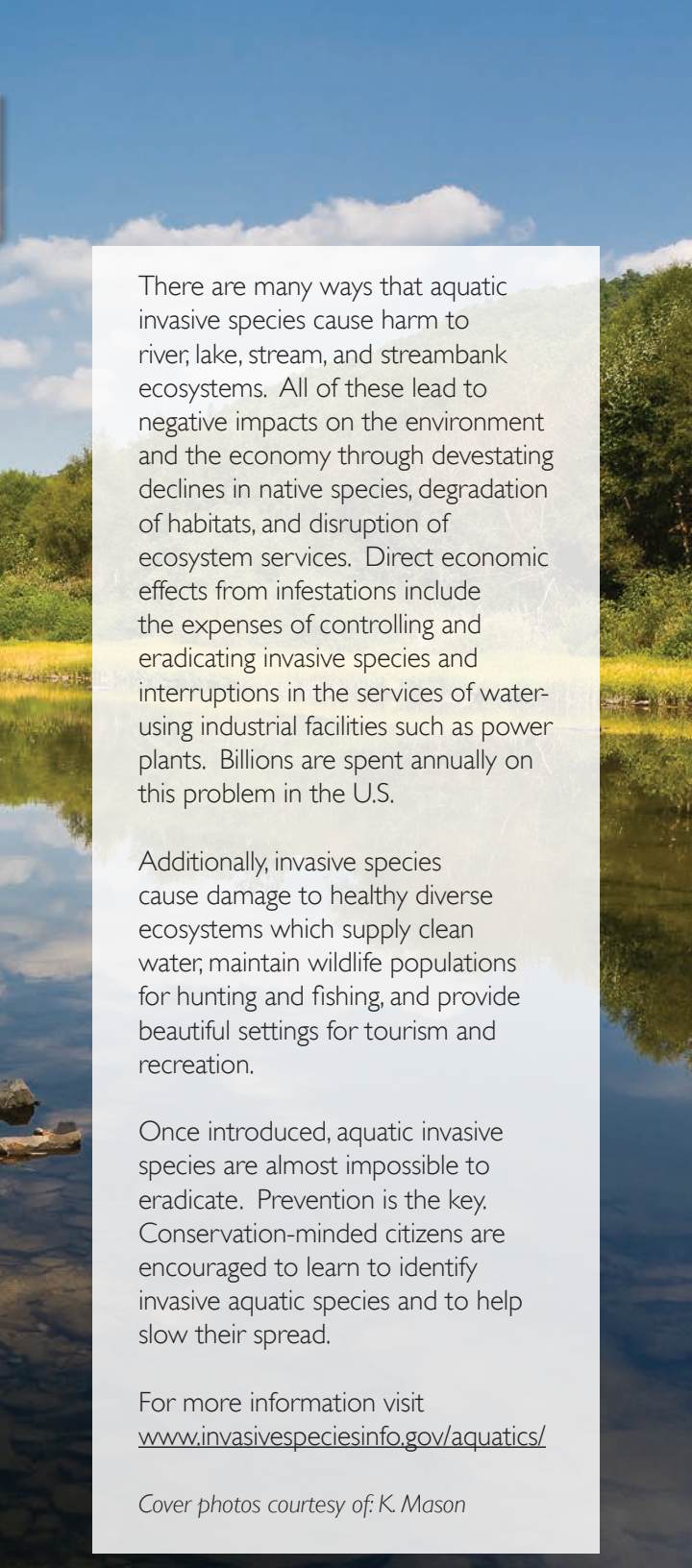
This brochure describes 11 of the most invasive aquatic species that threaten West Virginia's freshwater ecosystems. It contains information about their appearance, habitat, the ecological threat they pose, and the best ways to slow their spread and reduce their impact on the state's aquatic resources.



What are Aquatic Invasive Species?

Aquatic invasive species are organisms new to waterways that cause problems for native species and significant changes in aquatic habitats, water quality and flow. Eventually the recreational, local community, and industrial users of these aquatic resources are also negatively impacted. Outside of their native habitats, invasive species usually have fewer competitors and an absence of normal controls (like predators and diseases) to keep their populations in check. Consequently, they are able to do much more damage as exotic species in new habitats than when they are present in their native ranges.

Aquatic invasive species arrive by many different pathways. Most are transported via human activity. The release of live bait, dumping of aquariums, release of ballast water from international cargo ships, and accidental carrying of “hitch-hiking” organisms on boats are all examples of ways invasive species are inadvertently introduced to new places. Sometimes it is impossible to identify how organisms were introduced, which can make preventing or controlling the spread of harmful species even more challenging.



There are many ways that aquatic invasive species cause harm to river, lake, stream, and streambank ecosystems. All of these lead to negative impacts on the environment and the economy through devastating declines in native species, degradation of habitats, and disruption of ecosystem services. Direct economic effects from infestations include the expenses of controlling and eradicating invasive species and interruptions in the services of water-using industrial facilities such as power plants. Billions are spent annually on this problem in the U.S.

Additionally, invasive species cause damage to healthy diverse ecosystems which supply clean water, maintain wildlife populations for hunting and fishing, and provide beautiful settings for tourism and recreation.

Once introduced, aquatic invasive species are almost impossible to eradicate. Prevention is the key. Conservation-minded citizens are encouraged to learn to identify invasive aquatic species and to help slow their spread.

For more information visit
www.invasivespeciesinfo.gov/aquatics/

Cover photos courtesy of: K. Mason



Invasive crayfish: Virile, Rusty, & Red swamp crayfish

Orconectes virilis, *O. rusticus*, & *Procambarus clarkii*

Description

Virile crayfish and rusty crayfish are two known invasive species in West Virginia. The red swamp crayfish is in Maryland and likely will invade West Virginia in the future.

Habitat

Invasive crayfishes occur in wetlands, rivers, and streams across West Virginia. Habitats with a high buildup of silt and sediment appear to be preferred by invasive crayfishes in West Virginia. As this source of pollution increases across West Virginia, opportunity for invasion by these crayfishes increases.

Ecological Threat

West Virginia has 23 native crayfish. Invasive crayfish compete directly with native crayfishes for food and shelter. When invasive species move in, native crayfish are subject to increased predation and competition. This results in poorer health for native populations, and may lead to their elimination from the watershed. The invasive crayfish in West Virginia attain larger adult body sizes faster than the majority of our native species, and are much better adapted to maintaining territories when co-occurring with native crayfishes.

Management

Invasive crayfish introductions primarily occur when anglers release unused bait into streams. Don't dump bait! Anglers should throw unused bait in the trash. Crayfish or other species purchased for bait should never be released into any waters of the state. Ideally, anglers using crayfish (or any other species) as bait should capture, use, and dispose of it at the fishing location. At this time there are no known means to completely eliminate invasive crayfishes once they are introduced. However, recent research in West Virginia does indicate invasive crayfishes do have difficulty establishing populations in clean and sediment-free streams.

Virile



Rusty



Red Swamp



Photo credits:

Background: Kent Mason, Bottom: Zachary Loughman

Invasive Aquatic Plants: Hydrilla & Parrot feather milfoil

Hydrilla verticillata & *Myriophyllum aquaticum*

Description

Hydrilla is a long, sinewy, underwater plant with small, serrated, pointed leaves in whorls of four to eight. Small, potato-like root tubers can be seen when a plant is pulled up from the bottom. Even small stem fragments or one tuber can start a new infestation. Parrot feather milfoil is an underwater plant with feather-like leaves that sometimes protrude above the water. Stout reddish-tinted stems support leaves in whorls of mostly five.

Habitat

Hydrilla and parrot feather milfoil are found in freshwater ponds, lakes, reservoirs, rivers and ditches. Hydrilla can grow rooted in depths of a few inches to 20 feet of still or slow-moving water, and can have stems 25 feet long. Parrot feather milfoil grows best when rooted in shallow water. It can tolerate a variety of light levels, sediment levels and temperatures. Fragments of either plant can survive free-floating.

Ecological Threat

Hydrilla grows aggressively—up to one foot a day! Both plants create thick mats of vegetation at the water's surface, shading out algae and native plants like pondweeds and wild celery. The dense mats can impede water flows and water intakes, impact the movement of boats, and clog swimming areas.

Photo credits:

Background (Hydrilla): L. J. Mehrhoff, U. Connecticut, Bugwood.com; Bottom, clockwise from top left: L. J. Mehrhoff, U. Connecticut, Bugwood.org , G. Lovell, Alabama DCNR, Bugwood.org , R. Vidéki, Doronicum Kft., Bugwood.org, R. Vidéki, Doronicum Kft., Bugwood.org.,

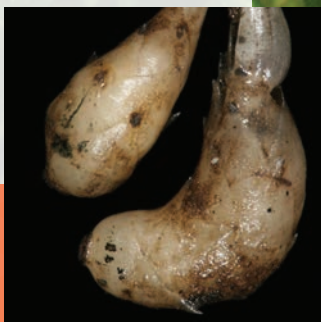
Management

Prevention of new infestations is a priority. Check boats, motors and gear for fragments of these plants when leaving an infested waterway and remove them to prevent their spread. Do not dump aquariums or plant non-native aquatic species in waterways. Manual or mechanical control tends to spread these plants and is only effective for small, contained areas. Chemical control with herbicides approved for aquatic plant use is possible for hydrilla but is less effective for parrot feather milfoil due to the leaves' thick waxy coating. Biological controls for hydrilla have been effective in some areas and include parasitic insects and sterile, triploid Chinese grass carp. Grass carp are only recommended for small ponds and lakes where the fish can be retained within the water body (a permit from the WVDNR is required to stock them).

Parrot feather milfoil



Hydrilla



Amphibian chytrid fungus, or Bd

Batrachochytrium dendrobatidis

Description

Bd is a chytrid fungus that affects most of the world's approximately 6,000 amphibian species. It originated in South Africa, and has become more prevalent in North America in recent years due to human importation of amphibians for a variety of uses. Bd causes a thickening of skin, which is deadly to amphibians; they absorb water and important electrolytes transdermally, and some also breathe through their skin.

Species Affected

Amphibians like toads, frogs, and salamanders are affected by Bd. Not all amphibian species infected with Bd die: the American bullfrog is said to be “resistant”, and red-backed and four-toed salamanders seem to have bacteria on them that inhibit Bd infections. But, these resistant species can transfer the disease to non-resistant species.



Ecological Threat

Bd is causing devastating population declines in native and rare amphibian species, and even some extinctions. It has been found in aquatic habitats in the Ohio River watershed. West Virginia's diverse salamander species, especially those that are largely aquatic, are at risk from this disease.

Management

Preventing the spread of Bd is the best way to protect our wild amphibian populations. Bd may be moved in the wild by infected carrier amphibians, infected bait bucket water or bait (salamanders and maybe crayfish), and recreationists' boots and gear that have been in infected waters.

Do not move or release any amphibians in the wild. Anglers should throw unused bait in the trash, and dump water from bait buckets on the ground away from waterways. After working or playing in potentially infected waters, recreationists should disinfect recreational gear to ensure diseases aren't spread.

In captivity, amphibians infected with Bd can be successfully treated through a combination of antifungal medications and disinfected habitat enclosures. Unfortunately, it is not practical at this time to treat wild amphibian populations.

Invasive Riparian Plants: Purple loosestrife, Common reed, Japanese & Giant knotweed

Lythrum salicaria, *Phragmites australis*, *Polygonum cuspidatum* & *P. sachalinense*

Description

Invasive riparian plants grow in streamside, floodplain, and wetland habitats. Purple loosestrife grows 4-10 ft tall, has a square woody stem, whorled leaves, and a spike of bright reddish-purple flowers. It was brought to North America as a garden plant. Common reed grows to 15 ft tall and has bushy clusters of purple or golden flowers. Common reed was likely introduced from ballast material of European ships in the early 19th century. Invasive knotweeds have bamboo-like stems, grow 10 ft tall, and have tiny, greenish-white flowers.

Habitats

All of these species can be found in wetlands and along rivers, streams, ponds or lakes, especially in disturbed areas.

Common Reed



Common Reed



Ecological Threat

Streamside vegetation contributes to the quality of the in-stream habitats they border. Native plants provide essential materials for food and cover needed by fish and wildlife. In addition, native plants hold streambanks in place, and absorb pollution from silt and sediment run-off.

Invasive riparian plants spread rapidly once established, forming dense stands that grow thickly among and over desirable vegetation. Invasive plants crowd out the native riparian species, degrading streambank habitat and ecosystem function, and depleting the source of food and cover materials for in-stream habitats.

Management

Prevent new infestations by not planting invasive plants as ornamentals. Seeds, shoots, and other pieces of these plants start new infestations, so take care not to spread them when walking along streams or cutting the plants for control treatments. Eliminate existing invasive plants with a combination of mechanical and chemical controls. Purple loosestrife can be controlled biologically with a predatory insect.

Knotweed



Purple loosestrife



Photo credits:

Background: K. Mason; Bottom, left to right: S. Dewey, UT St. Univ., Bugwood.org, J. Miller, USDA-FS, Bugwood.org, T. Heutte, USDA-FS, Bugwood.org, E. Coombs, OR Dept. Agric., Bugwood.org

Unwanted Pets

Description

Unwanted pets can become the cause of invasive species outbreaks when they are released into local waterways or woods. Although released pets usually get eaten as prey, die from disease, or get hit by cars, some survive and breed. Pet snakes, fish, lizards, turtles, birds, and snails may become problems in the wild when released.

Ecological threat

Animals that become established in a new ecological community can seriously disrupt the ecosystem into which they were introduced. Extreme examples of this are released pet pythons that are now breeding in Florida and causing serious declines in many native animal populations.

Significant, if less dramatic, examples are red-eared sliders. Historically known in West Virginia from only the Ohio River area, these turtles spread throughout the rest of the state with the help of humans. Introduced pet turtles can carry diseases, compete for basking sites, and interbreed with native turtles, threatening their health and genetic integrity.





Management

Pets don't belong in the wild! Many invasive animal introductions occur when pet owners no longer want to take care of their long-lived or mature pets (some of which can live for decades). Even native animals, like red-eared sliders, bought in-state as pets, should not be released.

Before getting a pet, research how long it will live and big it will get, and how much time, space, and food it will require.

If you no longer want or can care for a pet, contact pet stores for possible returns, or give it to another hobbyist or pet owner. Other options are to donate it to a local zoo, school or nature center, or contact a veterinarian for humane disposal guidance.

Don't dump aquariums into the wild! When disposing of living aquarium components such as plants or snails, soak them in a bucket filled with a 10% bleach solution for at least 24 hours, drain the water, and dispose of the materials in the trash.

Photo credits

Background: Red eared slider and mallard: B. Inaglory, commons.wikimedia.org; Bottom, left to right: Chinese mystery snail: OR Dept. Fish & Wildlife, commons.wikimedia.org, Goldfish: N. Aditya Madhav, commons.wikimedia.org

Didymo or “Rock snot”

Didymosphenia geminata

Description

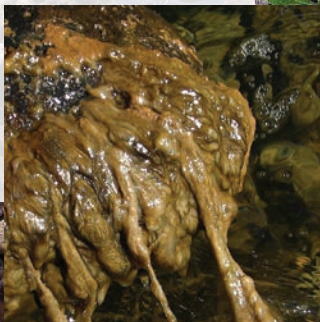
Didymo, or rock snot, is a one-celled algae that can form extensive mats on stream beds. These thick mats appear slimy, but feel more like cotton or wool fabric. Didymo can be white, yellow or brown in color, but is never green.

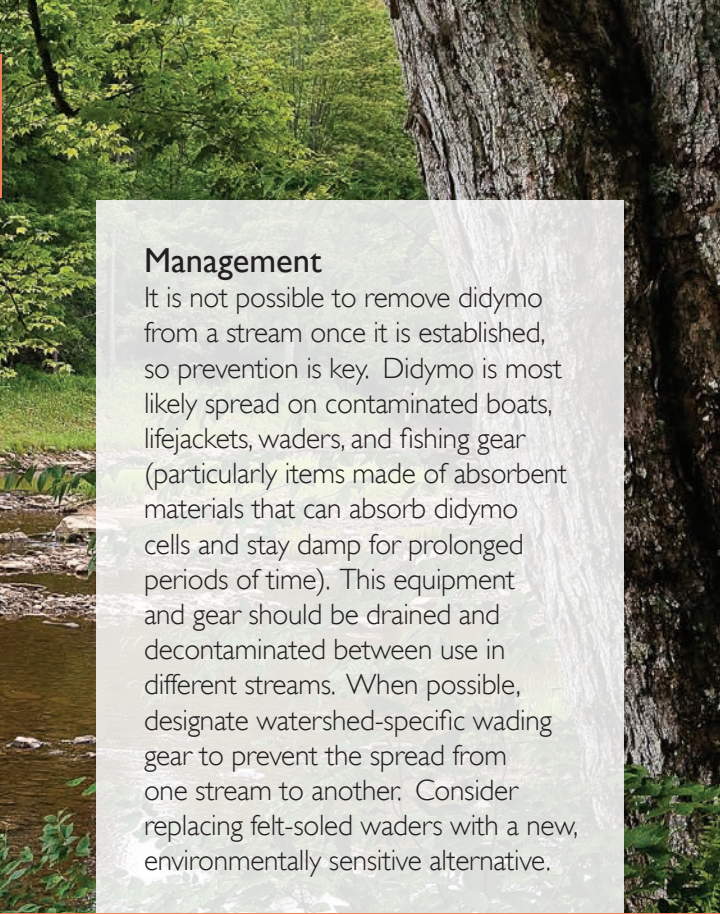
Habitat

Didymo is native to cold, nutrient-poor streams of far northern latitudes. However, its geographic range is expanding and it now inhabits more nutrient-rich streams in lower latitudes.

Ecological Threat

Didymo directly affects the food and cover for native aquatic species. Its algal blooms create thick mats that can last for months and coat the stream bottom, smothering plants and rocks, blocking sunlight, and disrupting ecological processes. Fish and other aquatic species are affected long term when native algae, and the amount and types of native aquatic insects, are reduced in an infested stream.





Management

It is not possible to remove didymo from a stream once it is established, so prevention is key. Didymo is most likely spread on contaminated boats, lifejackets, waders, and fishing gear (particularly items made of absorbent materials that can absorb didymo cells and stay damp for prolonged periods of time). This equipment and gear should be drained and decontaminated between use in different streams. When possible, designate watershed-specific wading gear to prevent the spread from one stream to another. Consider replacing felt-soled waders with a new, environmentally sensitive alternative.

SLOW THE SPREAD

- Check all gear and equipment after use and remove any algae. If you notice algae on your equipment at a later time, dispose of in the trash, not down a drain.

Non-absorbent items (e.g. boats, rubber waders)

- Soak and clean gear in solutions of either 2% household bleach or 5% dishwashing detergent for at least one minute.
- Dry boats in sunshine for 48 hours or longer, rotating to ensure no places hold moisture.

Absorbent items (e.g. felt-soled waders, clothing)

- Soak all soft items that take time to dry out in very hot water ($> 140^{\circ}$) for 40 min. or in 5% solution dishwashing liquid in hot water ($> 120^{\circ}$) for 30 min.

Photo credits:

Background: K. Mason; Bottom: T. Daley, PA DEP

Fish Diseases

Description

A number of invasive fish diseases threaten fishes of WV including viral hemorrhagic septicemia (VHS), largemouth bass virus (LMBV) and parasitic myxozoans (e.g. whirling disease in trout). VHS, not yet known in WV, was first detected in fish from the Great Lakes and has been called the most dangerous fish disease in the world. Fish afflicted with VHS do not feed, alternate between lethargic and hyperactive behavior and, in extreme cases, hemorrhage. LMBV was recently detected in West Virginia and severely infected fish have difficulty staying upright and hemorrhage. Two new myxozoan parasites have been recently described in the Mid-Atlantic States that infect smallmouth bass.

Habitats and Species Affected

LMBV only impacts largemouth bass. VHS is associated with significant mortality in muskellunge, northern pike, white bass, yellow perch, walleye, smallmouth bass, and crappie. Myxozoan parasites affect smallmouth bass, salmonids, catfish and others.



Ecological threat

Fish diseases lead to declines in fish health and population sizes. Pathogens can be present in streams but not cause disease or mortality until the fish become stressed due to pesticide or chemical pollution, changes in water temperature or flow, or introduction of non-native species.

Management

Diseased fish do not always show symptoms of being sick! Prevent new outbreaks by never moving fish, fish entrails, mud, bait or water between waterways, as these are the main ways fish diseases travel. Diseases cannot be eradicated once present in a stream, so prevention is critical.

If fish from potentially diseased streams are kept for consumption, transport cleaned fillets only and dispose of fish waste in municipal trash. Good water quality and natural stream conditions are also important for maintaining healthy fish populations.



Photo credits:

Background: K. Mason; Bottom, left to right: LMBV: USFWS, VHS: D. Kenyon, MI DNR; Whirling disease: V. Blazer; USGS

Invasive Mollusks: Asian clam, Zebra & Quagga mussels

Corbicula fluminea, *Dreissena polymorpha* &
D. bugensis

Description

Asian clams are light-colored mussels that grow up to 2 inches long. They prefer sand and gravel on stream and lake bottoms and also colonize hard surfaces like intake pipes. Very prevalent in the Ohio, Kanawha, New and Elk Rivers, the species was first recorded in WV in the 1960s.

The zebra mussel, named for the striped brown patterns on its shell, is a close relative to the slightly larger and lighter colored quagga mussel. Shells reach 1 ½ -2 inches in size. Zebra mussels grow on hard surfaces like rocks, docks, and boats. Quagga mussels also attach to hard surfaces or live on sand and mud river bottoms. As of 2012, zebra mussels are present in the Ohio, Kanawha, and Monongahela Rivers. Quagga mussels are reported nearby in OH, PA, and KY.

Asian Clams



Asian Clams



Habitats and Species Affected

These invasive mussels inhabit freshwater lakes, rivers, and reservoirs. Slow moving aquatic animals such as native mussels and turtles may be colonized when invasive mollusks attach to their shells. Invasive mollusks can be “biofoulers” that clog water intake and interior pipes of electric plants.

Ecological Threat

Invasive mussels are extraordinary filter feeders and change the water quality and food chain where they live, altering habitat for fish and other aquatic life. They may form thick colonies wherever they can attach themselves. Native mussels are threatened with loss of habitat and smothering.

Management

Exotic mussels, and their microscopic larvae, are easily moved between waterways in the movement of infested boats, gear, and bait buckets. Check, clean and dry boats between use in different waterways or lakes. SCUBA divers should decontaminate their gear. Anglers should scrub boots with a bleach solution before moving between waterways, throw unused bait in the trash or compost pile, and dump bait buckets away from streams and lakes.

Zebra



Quagga



Photo credits:

Background: USNPS; Bottom, left to right: USGS Archive, USGS, Bugwood.org; USGS Archive, USGS, Bugwood.org; J. Clayton, WVDNR; USNPS

Northern snakehead fish

Channa argus

Description

The northern snakehead has a long, thin body that can grow to almost four feet and weigh up to 15 pounds. It has a somewhat flattened head with eyes located on the sides. As the name implies, the scaled head looks like a snake's head and includes a large mouth with sharp, canine-like teeth and a protruding lower jaw. Coloring is gold-tinted brown to dark brown with black blotches. They eat all types of aquatic life. Snakeheads have the ability to survive out of the water and can travel over land to new bodies of water by wiggling their bodies over the ground.

Snakeheads are established in the Potomac River in Virginia. Before their threat was realized, snakeheads were openly sold in U.S. live fish markets and in pet shops. Release through aquarium dumping likely introduced this fish into the wild.



Habitats Affected

Snakeheads inhabit freshwater streams and rivers.

Ecological Threat

Snakeheads are very aggressive and outcompete native species for food and habitat. Shifts in populations of native wildlife, like fish, crayfish, frogs, small reptiles, and even birds and mammals, may be seen when snakeheads are established in a stream.

Management

It is illegal to import and transport snakeheads across state lines. If you catch a snakehead, kill it, put it on ice, and report it to the WVDNR. Prevent the spread of snakeheads and other invasive aquatic species by not dumping aquariums. Always drain water from your boat, livewell, and bilge before leaving any water access.

The native bowfin, a robust fish with a dorsal fin that covers over half the length of its body, can be distinguished from the snakehead by its broadly rounded head with no scales, pelvic fins located mid-body, and short anal fin.



Photo credits:

Background: Kent Mason; Bottom: USGS Archive, USGS, Bugwood.org, D. Raver, USFWS

Asian Carp: Silver and Bighead

Hypophthalmichthys molitrix & *H. nobilis*

Description

Silver and bighead carp have scaleless heads, large mouths, a silvery appearance, and eyes located very low on their heads. Bighead carp will have scattered dark blotches on their bodies. Silver carp also are fish that become highly excited near running motors and jump, creating hazards for people on boats or personal motorcraft.

Bighead and silver carp were first imported to the southern U.S. from Asia as food fish and to improve water quality. They filter plankton and eat aquatic weeds in ponds. These invasive carp escaped and moved up the Mississippi drainage to the Ohio River. As of 2012, only the bighead has been found in West Virginia.



Silver



Silver

Habitat or Species Affected

All freshwater fish species are negatively affected wherever these carp species become established.

Ecological Threat

Silver and bighead carp can grow very large (40 inches, 50 lbs). They eat zooplankton by filtering it from the water, disrupting the natural system by reducing this food source for larval fishes of other species. Because carp limit native species' food sources, they can alter the entire aquatic ecosystem where they establish.

Management

Join fishing derbies and events to reduce the numbers of invasive carp and help slow their spread. Electric fences and walls created with bubbles have been tried to prevent them from moving into various waterways. There is currently no known way to eradicate invasive carp from big rivers.



Bighead



Bighead

Photo credits:

Background: K. Mason, Bottom, left to right: N. Tessler, EnviroScience, Inc., Bugwood.org, L. Lewis, USFWS, Bugwood.org, USFWS, MI Sea Grant, Bugwood.org, USGS Archive, USGS, Bugwood.org

Small Invasive Fishes

Description

Many species of small minnow-like fishes (e.g. guppies, minnows, darters) are used by anglers for bait, by hobbyists for aquariums, and pond owners for mosquito control or predator forage. Some are imported from outside the U.S., while others are native to waters outside of West Virginia. When these fishes are introduced into new waters in which they are not indigenous, some that reproduce prolifically and outcompete native fishes become invasive.

Species Affected

Native minnows, darters, and other small fishes are impacted by non-native invasive small fishes.

Ecological Threat

Non-native invasive small fishes may cause declines in native fish population when they compete for limited habitat, eat the young, introduce new diseases, or genetically weaken populations through interbreeding. West Virginia's natural fish diversity is especially threatened when invasive fishes interbreed with native and endemic species (and dilute their gene pools), displace indigenous species from their ecological habitats, or extirpate them from their native ranges.

Management

Prevention is the most effective and cost efficient way to manage invasive species. Anglers can help prevent new introductions when they capture live bait from the drainage they intend to fish, and return unused bait where it was caught. If using store-bought bait, anglers should throw unused bait in the trash or compost pile. Don't dump bait!

It is illegal to release into public waters fish (other than a few game species exceptions) or any aquatic organisms without a WV Division of Natural Resources stocking permit. Aquarium hobbyists should never release unwanted fish into waterways. Pond owners are encouraged to use fish native to West Virginia for mosquito control and forage fish.



Photo credits:

Background: K. Mason; Bottom (Telescope and whitetail shiners): Copyright American Fisheries Society. Used with permission.

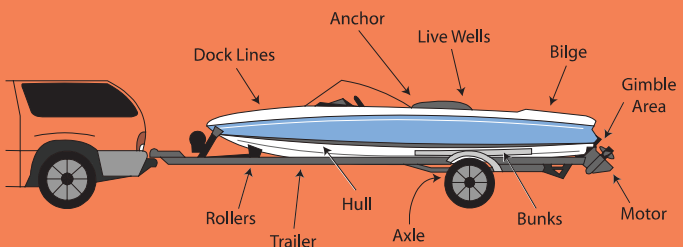
How you can help SLOW THE SPREAD of aquatic invasive species

- **Learn** the common invaders and watch for them when visiting natural areas.
www.invasivespeciesinfo.gov/aquatics
- **Check** for and remove “hitch-hiking” plants and animals, mud, and pooled water before leaving a boat take-out area.
- **Drain** boats, gear, and live wells thoroughly before leaving a stream access area.
- **Clean** equipment, live wells, and gear before entering a new waterway.
- **Disinfect** by: hot (104°) water; bleach water (ratio: 1 gallon + 1/8 cup bleach) for 5 minutes; 100% vinegar for 20 minutes; or salt water (ratio= 1 gallon water + 2 tablespoons salt) for 24 hours.



STOP AQUATIC HITCHHIKERS!

Prevent the transport of nuisance species.
Clean all recreational equipment.
www.ProtectYourWaters.net



- **Dry** watercraft and gear completely before using in another body of water.
- **Do not move** any fish or fish parts, salamanders, crayfish, or other aquatic organisms from one drainage or waterway to another.
- **Remember** that releasing small minnow-like fishes into public waters without a WVDNR stocking permit is illegal.
- **DON'T DUMP BAIT!** Capture live bait from the drainage in which you are fishing. Put unused store-bought bait in the trash.
- **Report** new sightings of Asian carp to the WV Division of Natural Resources.
- **Buy** native plants whenever possible. Avoid growing garden plants known to invade wild places.
- **Don't dump** aquariums into the wild.
- **Do not release** unwanted pets into the environment. If you no longer want your pet, return it to a local pet shop for resale or trade, give it to another hobbyist, or donate it to a school, nursing home, or hospital.
- **Volunteer!** Share information about aquatic invasive species among your community. Join with others to monitor and slow the spread of infestations.



Photo credits:

Background: K. Mason; Bottom, left to right: David K. Britton, Pennsylvania Fish and Boat Commission